



**OPERATIONAL LAND IMAGER
(OLI)**

**CONTRACT DOCUMENTATION
REQUIREMENT LIST
(CDRL)**

May 13, 2004

**GODDARD SPACE FIGHT CENTER
GREENBELT, MARYLAND**

CONTRACT DOCUMENTATION REQUIREMENT LIST (CDRL)
FOR THE OPERATIONAL LAND IMAGER

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RELEASE
DATE: _____

DOCUMENT CHANGE RECORD

SHEET

CHANGE DOCUMENT:			COPY NO.
NUMBERED		REVISION	DATED
CHANGE (DATE)	TO INCORPORATE THE CHANGE INTO THE DOCUMENT: 1. ADD PAGES 2. REMOVE PAGES		OTHER COMMENTS REGARDING THIS CHANGE (AUTH., INSTRUCT., ETC.)

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NOTE: After revising the document, file this sheet in document preceding table of contents.

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1.0 INTRODUCTION

This Contract Documentation Requirements List (CDRL) document defines the requirements for deliverable documentation to be provided by the Operational Land Imager (OLI) contractor. Section 2.0 includes definitions and instructions for mailing and/or distribution. Table 3-1 presents the CDRL item by item, with due dates, quantity, and a distribution key. Section 4.0 provides the Data Item Description (DID), a description of each item and describes use, and preparation information. Except where specifically indicated to the contrary, the formats and drawing standards used shall be those normally used by the OLI Contractor and/or by its subcontractors.

- (a) Statement of Work for the Operational Land Imager (SOW), 427-xx-xx-xx
- (b) Operational Land Imager Specification (Spec), 427-xx-xx-xx
- (c) Landsat Imager Mission Assurance Requirements (MAR), 427-xx-xx-xx
- (d) Operational Land Imager Special Test Requirements (STR) 427-xx-xx-xx
- (e) Operational Land Imager Acronym List and Lexicon 427-xx-xx-xx
- (f) NPOESS General Instrument Interface Document (NGIID), xx OCT 2003

2.0 DEFINITION OF DUE DATES/MATURITY, DEFINITION OF CATEGORIES, AND MAILING DISTRIBUTION INSTRUCTIONS

2.1 DUE DATES/MATURITY - RELATED DEFINITIONS

The following definitions apply to the "DUE DATE, MATURITY" column in Table 4-1.

(a) DUE DATE:

- (1) IPDR, ICDR, IPER, etc. Instrument Preliminary Design Review, Instrument Critical Design Review, Instrument Pre-Environmental Review, Instrument Pre-Ship Review, etc. Documentation to be delivered to GSFC 10 working days prior to review, unless otherwise stated.
- (2) As Generated. After each initial edition, revision, addition, etc. Items that are critical to schedule, performance, or interface shall be transmitted to GSFC by facsimile or express mail within 48 hours of generation. When available, an electronic version shall also be provided.
- (3) Monthly. submitted on monthly basis
- (4) I. Launch Date
- (5) DACA. days after contract award

(b) MATURITY:

- (1) Preliminary. The initial submission of an item. To be completed as is practicable at the time of preparation.
- (2) Final. The complete thorough submission of an item for approval, review, or information. This does not preclude updating later. Any updates shall require the same "approval/review" process as was required for the previous

submissions.

- (3) Current. The best up-to-date information available at the time.

Other entries in the "DUE DATE, MATURITY" column are self-explanatory.

2.2 QUANTITY - RELATED DEFINITIONS

The quantities to be delivered shall be per the CDRL listing in column "Quantity (QTY)" in Table 3-1 of this document.

2.3 DISTRIBUTION - RELATED DEFINITIONS

The following definition applies to the "Distribution (DIST)" column in Table 3-1.

H – Hardcopy(s) of this documentation shall be delivered to the Contracting Officer at GSFC Code 427.

E - Data items shall be delivered in electronic format to a GSFC Landsat specified web portal unless otherwise noted in Table 3-1. The Contracting Officer shall be notified of electronic submission of the deliverable in writing. Electronic deliverables shall be delivered in the following formats unless otherwise approved by the government:

- Text Documents: PDF (searchable) or MSWord
- Presentations: PDF (searchable) or PowerPoint
- Spreadsheets: Microsoft Excel
- Database: Delimited ASCII files accompanied with database schema document defining tables and entries.
- Schedules: PDF and MS Project/FastTrack (TBD)
- Schematics and Drawings: PDF
- Photographs: JPEG or current industry standard.
- Video: Any readily available open standard (e.g., AVI, MPEG)

R – For Reviews, hardcopies will be made available at the review site for government representatives. (generally, this will be in addition an electronic copies being made available prior to the review.)

2.4 CATEGORY - RELATED DEFINITIONS

The following definitions apply to "Submission Category (CAT)" column in Table 3-1.

- A Approval: Documents in this category require approval by the GSFC Contracting Officer's Technical Representative (COTR) prior to use by the contractor. Receipt by the Government shall occur within the time specified in the "Due Date" column of Table 1 of this document. Requirements for re-submission shall be as specified in the letters of disapproval. For most cases the contractor will be required to resubmit the document within 30 days of receiving comments from the Government. If the contractor has not received response from GSFC within 60 days of delivery of a CDRL item (15 days for test procedures), the contractor may proceed as if the document has been approved.
- R Review. Documents in this category require delivery to the Government prior to use and within the time period specified in the "Due Date" column of Table 1 of this document. They are subject to evaluation by the Government or its designated representatives to determine Contractor effectiveness in meeting contract objectives. When Government evaluations reveal inadequacies, the Contractor shall correct the documents within 30 days of receiving comments or provide a plan approved by the Government for closing deficiencies.
- I Information. Data in this category shall be delivered to the Government within the time period specified in the "Due Date" column of Table 1 for the purpose of determining current program status, progress, and future planning requirements.

3.0 OLI CONTRACT DISTRIBUTION LIST

Table 3-1 comprises the OLI Contract Distribution List.

Table 3-1 OLI Contract Documentation Requirement List (CDRL)

#	MANAGEMENT	DUE DATE, MATURITY	QTY	DIST	CAT
PM-1	Earned Value System Baseline Review Package	60 DACA Update if Re-baseline occurs	5	R, E	I
PM-2	WBS Diagram and Task Description Updates	45 DACA, Update As Required	3	H, E	I
PM-3	Detailed Schedules	45 DACA, Update at MPSR	1	H, E	I
PM-4	Monthly Project Status Reviews (MPSR)	Monthly (within 7 days of end of previous month)	10	E, R	I
PM-5	Financial Reports (NASA Form 533)	Monthly (within 7 days of end of previous month)	2	H	R
PM-6	Earned Value System Reports	Monthly (within 7 days of end of previous month). Format 5: Updated list of the rankings every 6 months, based on performance to date.	1	E	I
PM-7	Responses to Formal Actions	30 Days after receipt of action from GSFC, Final	3	H, E	A
PM-8	Final Report	Launch + 5 mo for FM1, FM2, and optional FM3 , Final	2	H, E	A

#	REVIEWS	DUE DATE, MATURITY	QTY	DIST	CAT
RE-1	Instrument System Requirements Review (ISRR) Data Package	Electronic 5 days prior to ISRR	40	H, R, E	I
RE-2	Peer Review Data Packages	At Review	10	R,E	I
RE-3	Instrument Preliminary Design Review (IPDR) Data Package	Electronic 5 days prior to IPDR	50	H,R,E	I
RE-4	Instrument Critical Design Review (ICDR) Data Package	Electronic 5 Days Prior to ICDR	50	H,R,E	I I
RE-5	Instrument Pre-Environmental Review (IPER) Data Package	Electronic 5 days prior to IPER, Final	50	H,R,E	I
RE-6	Instrument Pre-Ship Review (IPSR) Data Package	Electronic 5 days prior to IPSR, Final	50	H,R,E	I
RE-7	Data in Support of Mission Level Reviews	14 days prior to review	2	H, E	R

#	SOFTWARE	DUE DATE, MATURITY	QTY	DIST	CAT
SW-1	Software Development and Management Plan	90 DACA	2	H,E	A
SW-2	OLI Data Format Control Documents	IPDR (preliminary) ICDR (Final)	10	H,E	A
SW-3	Software Design Document/Users Guide	ICDR (preliminary) IPSR (Final), Update as Required	3	H,E	I
SW-4	Software Test Readiness Review (SWTRR) Data Package	At review, Final	10	R	I
SW-5	Software Acceptance Review (SWAR) Data Package	At review, Final	10	R	I
SW-6	GSE Software Test Readiness Review (GSWTRR) Data Package	Electronic 5 days prior to GSWTRR, Final	10	E,R	I
SW-7	Flight Software Test Plan	IPDR	2	H,E	R
SW-8	Software Test Procedures	5 Days prior to each activity, Final	1	E	I
SW-9	Software Test Reports	15 days after test (preliminary) 30 days after Test (Final)	1	E	I
SW-10	Software Delivery Package	With submittal of each software release.	1	E	I

#	INTEGRATION AND TEST	DUE DATE, MATURITY	QTY	DIST	CAT
IT-1	Spare Parts List	15 days prior to each major review Updates as Required	1	E	I
IT-2	Command and Telemetry List and Description	30 Days prior to ICDR Updates as Required	5	H, E	R
IT-3	Detailed Test Procedures	5 Days prior to First Unit Tests, Final	1	E	I
IT-4	Packaging, Handling, Storage, and Transportation (PHS&T) Plan and Procedures	30 Days prior to ICDR, Final	3	H, E	R
IT-5	Storage Testing Procedures	ICDR, Prelim IPSR, Final	3	H, E	R
IT-6	OLI to SC Integration Procedure(s)	30 days prior to IPSR	1	E	R

#	CALIBRATION/VALIDATION	DUE DATE, MATURITY	QTY	DIST	CAT
CV-1	Calibration/Validation Plan	PDR, CDR (Final), Updates as required	3	H, R, E	A
CV-2	Calibration/Validation Procedures	30 days prior to use. Update as required	3	H, E	R
CV-3	Calibration/Validation Test Reports	E-Data 14 days post-test Report – 30 days post-test	3	H, E	I
CV-4	Calibration/Validation Summary Report	L-30 days, IOC	3	H, E	I
CV-5	Radiometric Math Model	15 days prior to ICDR, Final Update as required	3	H, E	R
CV-6	OLI Optical Analytical Model	IPDR 15 days prior to ICDR, Final Update as Required	3	H, E	I
CV-7	Algorithms and Calibration Parameters	IPSR, IOC	3	H,E	R

#	SYSTEMS ENGINEERING	DUE DATE, MATURITY	QTY	DIST	CAT
SE-1	Configuration Change Requests (CCR) Class I	As Generated, Final	5	H, E	A
SE-2	Contractor Generated Internal Technical Information	As Requested,	1	E	I
SE-3	Engineering Analyses & Test Reports	As Generated, Final	5	H, E	I
SE-4	Trend Analysis (List) (Reports)	ICDR, Final	2	H, E	R
		IPER, Final IPSR, Final Monthly, Current.	2	H,E	I
SE-5	Structural Math Model	15 days prior to ICDR, Final Update as required	3	H, E	I
SE-6	Thermal Math Model	ICDR, Final Update as required	3	H, E	I
SE-7	Wiring Diagrams	30 Days prior to ICDR Final at IPSR Updates As Required	2	H, E	I

SE-8	Approved or Controlled Drawings	Electronic at ICDR, UAR Hardcopies, Elect Final set at IPSR (as built)	2	H, E	I
SE-9	System Performance Verification Plan	15 days prior IPDR 30 Days prior to ICDR, Final Updates As Required	5	H,E	R
SE-10	Verification Reports	As Generated, Final	1	H, E	I
SE-11	Interface Control Documents Inputs	As generated based on Observatory needs	5	H, E	R

#	SYSTEMS ASSURANCE	DUE DATE, MATURITY	QTY	DIST	CAT
SA-1	Reliability Report	30 Days prior to IPDR 30 Days prior to ICDR, Final Class I change submittal, Final	5	H, E	I
SA-2	Critical Items List (CIL)	30 Days prior to ICDR, Updates As Required	5	H, E	I
SA-3	Worst Case Analyses	As Generated, Current	5	H, E	I
SA-4	Failure/Anomaly Reports (FAR)	Oral Within 24 Hours to COTR and/or Flight Assurance Manager, Prelim Written 3 Working days, Final after FRB closeout	5	H, E	R
SA-5	Material Review Board (MRB) Decisions on Non-Conformance	Update as Generated, Final	5	H, E	A
SA-6	Responses to Alerts	10 Working Days after receipt of Alert, Current	5	H, E	I
SA-7	Acceptance Data Package	End-item delivery, Final	1	H, E	A
SA-8	Limited Life Items List	15 days prior to IPDR, Prelim 30 Days prior to ICDR, Final Updates As Required	5	H, E	I

SA-9	Material Identification Lists (MIL)	90 DACA, Preliminary 30 Days prior to ICDR, Final Updates As Required Final at IPSR (as built)	5	H, E	R
SA-10	Safety Waiver/Non-Compliance Requests	As Generated, Final	5	H, E	A
SA-11	Photographic & Video Records	As Required, Final	See DID	A, E	I
SA-12	Parts Identification List (PIL)	90 DACA, Preliminary 30 Days prior to ICDR, Final Updates As Required Final at IPSR (as built)	5	A, E	R
SA-13	Contamination Control Plan	15 days prior to IPDR, Prelim 15 days prior to ICDR, Final	5	A, E	R
SA-14	Missile System Pre-launch Safety Package (MSPSP) Inputs	30 Days prior to ICDR, Draft 30 Days prior to IPSR, Final Update as Required	5	A, E	A
SA-15	Orbital Debris Assessment Inputs	IPDR, ICDR	5	A, E	R
SA-16	Mechanism Life Test Plan	30 days prior to IPDR	5	A, E	R

#	ON ORBIT	DUE DATE, MATURITY	QTY	DIST	CAT
OO-1	OLI On Orbit Initialization and Validation Plan	90 days prior to IPSR	5	A, E	R
OO-2	OLI Orbital Procedures (name)	90 days prior to IPSR	5	A, E	I
OO-3	OLI Data Users Manual	Final at IPSR	20	A, E	A
OO-4	Operation and Maintenance Manuals	At start of EDU System Integration	5	A	A
		At start of PFM System Integration	5	A	A
		At start of each FM System Integration	5	A	A
OO-5	On Orbit Performance Report	30 days following IOC	5	A, E	A

4.0 DATA ITEM DESCRIPTIONS

MANAGEMENT DIDs

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

PM-1

EARNED VALUE SYSTEM BASELINE REVIEW PACKAGE

3. Reference:

- Statement of Work; Para. 5.3
 - NPD 9501.3A, Earned Value Management
 - NFS 1852.242-74, Notice of Earned Value Management System (March 99)
 - NFS 1852.242-75, Earned Value Management System (March 99)
-

4. Use:

To provide a description of the contractor's methods, policies, procedures utilized in meeting the requirements of NPD 9501.3A. To evaluate the contractor's project management system, and demonstrate the use and understanding of the system by all levels of management. It shall be held at the CF within 60 days after ATP. Follow-up reviews may be required to assess actions taken to correct deficiencies.

5. Preparation Information:

Review will evaluate the reasonableness of contractor schedule and Earned value implementation, and establish a baseline for management of the Project.

The EVS Baseline Review Package shall describe the contractor's Earned Value System.

The EVS Baseline Review Package shall describe the relationship between the WBS and the EVS system and reporting.

The EVS Baseline Review Package shall identify the internal organization elements and the major subcontractors responsible for accomplishing the authorized work.

The EVS Baseline Review Package shall describe the relationship and level of integration of all management control systems (e.g., Planning and Scheduling, Budgeting, Estimating, Work Authorization, Cost Accumulation).

The EVS Baseline Review Package shall identify the managerial positions responsible for controlling overhead.

The EVS Baseline Review Package shall describe how the EVS is integrated with the contractor's functional organizational structure.

The EVS Baseline Review Package shall identify physical products, milestones, technical performance goals to be used to measure output.

The EVS Baseline Review Package shall describe the method of maintaining time phased baseline.

The EVS Baseline Review Package shall explain the cost to schedule correlation at the work/planning package level.

The EVS Baseline Review Package shall identify management reserve and undistributed budget.

The EVS Baseline Review Package shall identify the authority process for allocating management reserve and undistributed budget.

The EVS Baseline Review Package shall identify bases for allocating the cost of apportioned effort.

The EVS Baseline Review Package shall describe the procedures for measuring performance.

The EVS Baseline Review Package shall describe the procedures for incorporating authorized changes.

Prepare in accordance with the contractor standard plans and policies.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

PM-2

2. Title:WBS DIAGRAM AND TASK DESCRIPTION UPDATES

3. Reference:MIL-STD-881.A

4. Use:

Provides for relating specifications to the contract end item. Identifies controllable work elements for estimating resources, budgeting, and pricing work assignments and authorization. Serves as a framework for reporting cost, schedule, and technical performance.

5. Preparation Information:

The contractor shall provide the Contract Work Breakdown (end-item) structure WBS dictionary and Organizational Work Breakdown Structure in an indentured listing at the time of proposal submission. Using the convention that the Project/Program is considered Level 1.0, the submitted WBS shall provide details to the WBS Level 4. A list of changes/updates shall be provided every six months, or following major revisions to the WBS.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

PM-3

DETAILED SCHEDULES

3. Reference:

4. Use:

To describe schedule and progress for the OLI instrument, and for understanding and mapping out in detail an efficient process for integrating together all program elements to ensure all aspects of the program are completed when required.

5. Preparation Information:

Current activities shall be addressed as part of a Top-Level Summary of the Schedule, this shall be included with the Monthly Project Status Report (TBD).

The Integrated Master Schedule shall include:

- A Activities detailed by task with expected start and completion dates
- B Activities associated with major items, components, or definable subassembly, such as printed wiring assembly (PWA).
- C Fabrication schedules detailed to the mechanical subassembly level, and to the PWA level, and showing substantive milestones.
- D An assembly/test flow diagram that shows sequences of fabrication, assembly, integration and test for components, subsystems, and system and includes quality assurance test points and associated inspection level requirements.
- E The contractor shall provide the Government with a series of integrated network schedules and bar charts as described below:

- (a) Master Schedule – The master schedule shall include programmatic milestones/events for the overall program from design, manufacturing, integration and test through launch including data on major procurements. The schedule shall be in a format suitable for viewgraph presentations that summarize the schedule data and status contained in the integrated logic network. This chart will be delivered directly from the integrated logic network and will include major program milestones such as Preliminary Design Review (PDR), Critical Design Review (CDR), Pre-Ship Review (PSR), etc.
 - (b) Integrated Logic Networks – These networks shall be established for each subsystem or subassembly to the electronic board level. The contractor shall provide an electronic version of the detailed integrated logic network.
 - (c) Intermediate Schedule – An Intermediate Schedule for each second level WBS shall be submitted. Control milestones will be included on the Intermediate Schedule.
 - (d) Control Milestone Trend Report – A control milestone trend chart shall be submitted. This report shall consist of the baseline control milestones that have been agreed. The report will also contain a list of the control milestones expected to complete during the reporting period, their baseline completion dates, and their current status.
 - (e) End Item Float Report – A monthly report shall be submitted for each deliverables subsystem or subassembly comparing the current month floats to the float of the previous month and explain any changes.
 - (f) Monthly Schedule Analysis – A monthly analysis shall be submitted and a part of the Monthly Project Status Report that will contain a brief description of the current status of each subsystem or subassembly along with descriptions of any existing or potential problems areas. The critical path and near critical paths will be explained along with possible work-arounds being considered to maintain the schedule.
- F These schedules shall be presented by a flow type network diagram, and by Gantt schedule milestone charts. A preliminary network diagram submitted with the proposal shall contain a minimum of 50 events.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

PM-4

2. Title:MONTHLY PROJECT STATUS REVIEWS

3. Reference:SOW

4. Use:

To evaluate contract status. These reports will be used to provide an opportunity for face-to-face discussions between the contractor and NASA regarding project status, plans and issues.

5. Preparation Information:

The Monthly Project Status Review will be presented at a face to face meeting with the LPO within 14 days of the close of the monthly accounting period. These meetings will occur at the contractors facility, unless modified by mutual consent.

The Monthly Project Status Review shall include the following:

- A. Report of Key Technical Parameters, including mass and power budgets, and their current best estimates. The values to be presented shall be at least to the major component level of the subsystems, e.g. Mechanism, Power supplies, heaters, cabling, etc. The accuracy of the values shall be identified.
- B. Technical status for design and development activities
- C. A comparison of planned versus actual accomplishments for the period of time since the prior report.
- D. Monthly Schedule Status and analysis of variations

- E. Summary of the Monthly Financial Status Report
- F. Summary of the Earned Value System Report
- G. A detailed 12-month “rolling-wave” schedule (3 months of actual, plus 9 months of forecast)
- H. Problems encountered during the reporting period, and anticipated approaches for resolution (including, as appropriate, technical issues, manpower and staffing, supplier and subcontractor issues, etc.)
- I. Status of open issues and problems from prior reporting periods
- J. Significant plans and activities for the following month
- K. Class I and Class II proposed and approved Configuration Control Board Changes
- L. Financial Status
- M. Risk Status for top risks

The contractor shall provide paper copies of viewgraphs and other presentation material for Government attendees at the time of the review. Also to be provided is one CD ROMs containing all presentation material readily available in mutually agreed upon electronic format. Presentation material may be in contractor format.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

PM-5

2. Title:FINANCIAL REPORTS (NASA FORM 533)

3. Reference:SOW Paragraph 2.1

4. Use:

To provide information for: (1) integrating cost and schedule performance data with technical performance measures, (2) assessing the magnitude and impact of actual and potential problem areas causing significant cost and schedule variances, and (3) providing valid, timely project status information to higher management.

5. Preparation Information:

The Monthly Financial Report shall be prepared in accordance with NFS 1852.242-73 and NPR 9501.2D, NASA Contractor Financial Management Reporting on NASA Form 533M. The report shall be submitted within 7 days of the end of the reporting period.

The Quarterly Financial Report shall be prepared in accordance with NFS 1852.242-73 and NPR 9501.2D, NASA Contractor Financial Management Reporting on NASA Form 533Q. The report is due 2 weeks prior to the period being reported.

At a minimum the reporting structure shall be in accordance with and to the lowest level of the WBS provided with solicitation.

The reporting categories shall include as a minimum:

- A. Direct labor by labor category
- B. Overhead
- C. Fringe Benefits
- D. Materials
- E. Material Overhead
- F. Subcontracts
- G. Travel
- H. Other Direct Costs
- I. Facilities Capital Cost of Money
- J. Award Fee
- K. Total CPAF

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

PM-6

2. Title:EARNED VALUE SYSTEM REPORTS

3. Reference:

SOW

NPR 9501.3

NFS 1852.242-74

NFS 1852.242-75

4. Use:

To provide information for (1) integrating cost and schedule performance data with technical performance measures, (2) assessing the magnitude and impact of actual and potential problem areas causing significant cost and schedule variances, and (3) providing valid, timely project status information to higher management.

5. Preparation Information:

The EVSR shall include data pertaining to all authorized contract work, including both priced and unpriced effort, that has been authorized at a not-to-exceed amount in accordance with the Contracting Officer's direction. The EVSR shall separate direct and indirect costs and identify elements of cost for all direct reporting elements. The EVSR shall consist of the following:

- A. Format 1, Work Breakdown Structure (WBS): Format 1 shall provide data to measure cost and schedule performance by summary level WBS elements, and the hardware, software, and services NASA is buying. Critical/major subcontractor

summary-level performance measurement data shall be included as an attachment to Format 1. Subcontractor EVSR or Cost/Schedule Status Report (C/SSR) are acceptable.

- B.** Format 2, Organizational Categories: Format 2 provides the same data as Format 1, sorted by the contractor organization. If the contractor is organized by product, Format 2 is optional. Organizational category reporting shall be to the first level of the program's organizational structure.
- C.** Format 3, Baseline: Format 3 provides the budget baseline plan against which performance is measured. It is the baseline report used to track all changes to the Performance Measurement Baseline (PMB). Format 3 shall contain budget forecasts for two 3-month periods (columns 10 and 11), two subsequent 12-month periods (columns 12 and 13), and the remainder of the contract for the last period (column 14).
- D.** Format 4, Staffing: Format 4 shall provide workforce staffing forecasts for correlation with the budget plan and cost estimates and contain the workforce baseline which will be updated and submitted whenever the Performance Measurement Baseline changes. Organizational category reporting shall be to the first level of the program's organizational structure. Format 4 shall contain baseline and workforce forecasts for two 3-month periods (columns 10 and 11), two subsequent 12-month periods (columns 12 and 13), and the remainder of the contract for the last period (column 14).
- E.** Format 5, Explanations and Problem Analyses: Format 5 shall be a narrative report used to explain significant cost and schedule variances (+/- 10% or \$500k) TBD and other identified contract problems. Subcontractor variance analyses (determined by the prime contractor) and a discussion of the prime contractor's analysis of the subcontractor's performance shall be provided in Format 5. In the initial submission of the EVSR (Format 5), the contractor shall rank, in descending order of criticality (i.e., the most critical elements will be at the top of the list and the least critical will be at the bottom), all reporting-level WBS elements anticipated (as determined by the contractor Project Manager) to be schedule drivers, and all WBS elements (in a similar ranking) anticipated to be the cost drivers on the project. The contractor shall submit an updated list of the rankings every 6 months, based on performance to date. The Government reserves the right to modify this ranking based on Government perception of criticality. If the contractor uses "critical path" scheduling techniques, identification of the critical path by WBS element will meet the schedule drivers' requirement. Ranking of the critical path cost drivers shall also be provided. These critical elements shall reconcile to the Master Schedule submitted to the Government.

F. Variance Analysis: The Variance Analysis shall be a narrative report addressing the following:

- (a) Reporting elements that equate to 50 percent of the list of the schedule drivers (i.e., if 20 schedule drivers are listed, the 10 most critical schedule driver variances over \$100k will be addressed). If there are 10 or less schedule driver variances, all variances over \$100k shall be addressed.
- (b) Reporting elements that comprise the top 50 percent of the cost drivers (i.e., if 20 cost drivers are listed, the top 10 most critical cost driver variances over \$100k). If there are 10 or less cost driver variances, all cost variances over \$100k shall be addressed.
- (c) Impact to the contract Estimate-at-Complete (EAC) for all cost and schedule driver variances addressed.
- (d) Explanation for all variances at completion over \$500k.
- (e) Corrective Action Plan, as applicable.

FORMAT: EVSR formats shall be completed according to the instructions outlined in DI-MGMT-81466 and the following forms: Format 1 (DD Form 2734/1); Format 2 (DD Form 2734/2); Format 3 (DD Form 2734/3); Format 4 (DD Form 2734/4); and Format 5 (DD Form 2734/5). Images of the EVSR forms are located at http://www.acq.osd.mil/pm/newpolicy/cpr_cfsr/cpr_gif_new.html. Contractor format shall be substituted for EVSR formats whenever they contain all the required data elements at the specified reporting levels in a form suitable for NASA management use. The EVSR shall be submitted electronically and followed up with a signed paper copy. The American National Standards Institute (ANSI) X12 standards (transaction sets 839 for cost and 806 for schedule), or the United National Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT) equivalent, shall be used for Electronic Data Interchange. This information is located at <http://www.unece.org/trade/untdid/>.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

PM-7

RESPONSES TO FORMAL ACTIONS

3. Reference:

4. Use:

Provides input to formal responses prepared by the Project.

5. Preparation Information:

Preliminary responses may be in any form, such as fax or telecon, to promote coordination with the Project. Any final responses required by the Project shall be typed and shall include reproducible copies of any supportive material, such as:

- A. Engineering reports
- B. Sketches
- C. Drawing changes
- D. Documentation narrative changes
- E. Test reports, graphs, etc.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

PM-8

2. Title:FINAL REPORT

3. Reference:Contract Clause C.3

4. Use:To provide a summary of the performance of the contract.

5. Preparation Information:

Refer to contract clause 1852.235-73 (Section C.3 of the contract) for instructions regarding the final report.

REVIEW DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

RE-1

INSTRUMENT SYSTEMS REQUIREMENTS REVIEW (ISRR) DATA PACKAGE

3. Reference:SOW

4. Use:

To evaluate the requirements, requirements flow-down, and the operational concepts and to validate the realism of the functional and performance requirements and their congruence with the system configuration selected to conduct the mission.

5. Preparation Information:

The ISRR Data Package shall discuss contractor system level requirements, rationale, and flow-down plans to lower level requirements.

The ISRR Data Package shall cover requirements for the OLI instrument, Ground Support Equipment, flight software, ground test software, and processing algorithm.

The ISRR Data Package shall show how the current concept meets all government specified requirements including interface requirements.

The ISRR package shall include allocation of software requirements to CSCI and CSC.

Results of Review—As a result of successful completion of the ISRR, the system and its operation are well enough understood to warrant design and acquisition of the end items. Approved specifications for the system, its segments, and preliminary specifications for the design of appropriate functional elements may be released. A configuration management plan is established to control

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

RE-2

ENGINEERING PEER REVIEW DATA PACKAGE

3. Reference:

4. Use:

Engineering Peer Reviews (EPRs) focus on the design and implementation details at levels that system-level reviews can not address. They provide a resource for Design Teams to identify potential engineering design and implementation flaws, and increase the probability of success. Applying the EPR process early and throughout the product life cycle affords the maximum advantage in terms of resource efficiency as well as design confirmation and ultimate mission success.

Review team members are expected to thoroughly penetrate the subsystem functional design and engineering implementation to expose risk areas.

5. Preparation Information:

The EPR is an informal, tabletop review. EPRs should be applied at critical milestones during the design phase, prior to manufacturing or higher level code development, prior to testing, and after completion of subsystem verification. The reviews are essential to assess the integrity of the system design and evaluate subsystem performance relative to the success criteria.

Engineering Peer Reviews address, as appropriate for the timeframe conducted:

A. Design Adequacy: Drawings, Schematics, Analyses, Parts and Materials

- B. Manufacturing Adequacy: Facilities, GSE, Personnel, etc.
- C. Verification Approach: Test, Analyses, and Simulation
- D. Verification Results: Data Adequacy, Observed Margins, Trends, and Anomalies
- E. Calibration Approach and Results
- F. Claims of heritage from previous missions
- G. Lessons Learned

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

RE-3

INSTRUMENT PRELIMINARY DESIGN REVIEW (IPDR) DATA PACKAGE

3. Reference:

4. Use:

To demonstrate the Flight Equipment and GSE design meet the documented requirements.

5. Preparation Information:

The IPDR data package shall contain information to cover the OLI ground algorithm design.

The IPDR data package shall include Science/Technical Objectives, Requirements, General Specification.

The IPDR data package shall include responses to action items from previous reviews, including subsystem PDRs.

The IPDR data package shall include changes since the last review.

The IPDR data package shall address performance requirements.

The IPDR data package shall address system performance budgets.

The IPDR data package shall address error budget determination.

The IPDR data package shall address mass, power, data rate, commands, EMI/EMC.

The IPDR data package shall address interface requirements.

The IPDR data package shall address mechanical/structural design, analyses, and life tests.

The IPDR data package shall address electrical, thermal, optical/radiometric design and analyses.

The IPDR data package shall address software requirements, design, and development environment.

The IPDR data package shall address Ground Support Equipment design and work flow, and describe how each item will be fabricated, tested and certified when needed.

The IPDR data package shall address design verification, test flow and calibration/test plans.

The IPDR data package shall address instrument operations.

The IPDR data package shall address parts selection, and qualification.

The IPDR data package shall address preliminary Failure Modes, Effects and Criticality Analysis (FMECA); Probabilistic Risk Assessment (PRA); Fault Tree Analysis; and reliability analysis and results.

The IPDR data package shall address redundancy and redundancy management.

The IPDR data package shall address single point failures.

The IPDR Data Package shall address the list of long lead items, and of items that may become obsolete prior to completion of all flight instruments, identify those items that must be procured prior to CDR, and provide a plan for procuring these items and all parts.

The IPDR data package shall address contamination requirements and control plan

The IPDR data package shall address safety hazards identified for flight, range, ground hardware and operations.

The IPDR data package shall delineate the status of each document required at PDR as to its acceptability for use as is.

The IPDR data package shall address open interface items and the status of the IDD.

The IPDR Data Package shall present all program risks and address their mitigation.

The IPDR Data Package shall provide the status of all sub-contracts and discuss the preliminary design status of critical assemblies and sub-assemblies.

The IPDR Data Package shall present a summary of all breadboard and brassboard testing and present the test results.

The IPDR Data Package shall present the development status of sub-assembly engineering units, and available test data.

The IPDR Data Package shall address the producability of the design solution.

The IPDR Data Package shall address mission assurance to be imposed including parts and materials usage as well and workmanship standards imposed.

The IPDR Data Package shall address software assurance process.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

RE-4

2. Title:INSTRUMENT CRITICAL DESIGN REVIEW (ICDR) DATA PACKAGE

3. Reference:

4. Use:

To present the Flight Equipment and GSE design and operation and S/C interface aspects and to demonstrate that all related manufacturing documentation, processes and fixtures are in place before hardware manufacture begins, and to demonstrate that the design meets all performance requirements.

5. Preparation Information:

The ICDR data package shall include responses to action items from previous reviews, including subsystem CDRs.

The ICDR data package shall include changes since the last review.

The ICDR Data Package shall address the procurement status of long lead items and Electrical, Electronic, and Electromechanical (EEE) parts.

The ICDR Data Package shall address manufacturing flow, and the status of manufacturing and assembly drawings, bill of materials, etc.

The ICDR Data Package shall address manufacturing procedures.

The ICDR Data Package shall address mission assurance product check points and evaluation criteria.

The ICDR Data Package shall address standard applicable in-house processes.

The ICDR Data Package shall address special/unique tooling/fixtures.

The ICDR Data Package shall address facilities required for manufacturing.

The ICDR Data Package shall address personnel resources (time phased).

The ICDR Data Package shall address the delivery schedules for flight instruments and GSE.

The ICDR Data Package shall provide status of:

- (a) Performance specification (subsystems and GSE)
- (b) Block diagram and description of operation (instrument and GSE)
- (c) Schematic and logic diagrams (including waveforms, and timing)
- (d) Mechanical configuration drawings

The ICDR data package shall address detailed analysis from FMEA, fault tree analysis, and reliability analysis.

The ICDR Data Package shall address worst case analyses of:

- (a) Electrical circuits
- (b) Scanning drive system
- (c) Lubrication and lubrication loss
- (d) Tolerance and tolerance sensitivity analysis (including thermal and mechanical considerations)

The ICDR Data Package shall address stress analyses using NASTRAN with hand verification

The ICDR Data Package shall address thermal analysis of:

- (a) Detectors
- (b) Telescope
- (c) Electronics
- (d) In-flight calibrators

The ICDR Data Package shall address weight and power.

The ICDR Data Package shall address test plans (including all environmental tests)

The ICDR Data Package shall address manufacturing considerations

The ICDR Data Package shall address maintainability considerations

The ICDR Data Package shall address materials and processes lists

The ICDR Data Package shall provide a summary of deviations/waivers

The ICDR Data Package shall address contamination control and monitoring considerations

The ICDR Data Package shall address spares program

The ICDR Data Package shall address system safety hazards analyses

- (a) Hazards identification matrix
- (b) Single point failure summaries
- (c) Risk assessment rationale

The ICDR Data Package shall delineate the status of each document as to its acceptability for use as is. If updates and/or changes are required, these shall be estimated in required man-hours.

The ICDR data package shall address open interface items and the status of the IDD.

The ICDR Data Package shall present any additional test results from breadboard and brassboard testing

The ICDR Data Package shall present the test data from sub-assembly engineering models and the status of PTM development and testing results, if any.

The ICDR Data Package shall address the development status of all GSE, including test and calibration procedures, and the software/firmware design and operation and interface aspects as evaluated since the PDR

The ICDR Data Package shall address the status of all program risks and their mitigation

The ICDR Data Package shall address the status of all sub-contract design activity and schedule for delivery of PTM and flight hardware, and demonstrate that designs are complete and have been adequately reviewed

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

RE-5

INSTRUMENT PRE-ENVIRONMENTAL REVIEW (IPER) DATA PACKAGE

3. Reference:

4. Use:

Presents the description and results of the Pre-Environmental Test program, and demonstrates readiness for environmental testing.

5. Preparation Information:

The IPER Data Package shall include status of action items generated at prior reviews

The IPER Data Package shall include analyses and reports required at the review

The IPER Data Package shall include test and integration program descriptions and results

The IPER Data Package shall include failure report summaries including status of action and rationale for closure

The IPER Data Package shall include as-built documentation summary

The IPER Data Package shall include results of the functional and interface tests

The IPER Data Package shall include malfunctions and corrective actions

The IPER Data Package shall include comparison of measured performance with requirements and discussion of the effect of any variance and waivers

The IPER Data Package shall include mission operation constraints

The IPER Data Package shall include contamination avoidance requirements

The IPER Data Package shall include safety requirements

The IPER Data Package shall include list of spares for flight equipment and GSE

The IPER Data Package shall include review of instrument handling procedures

The IPER Data Package shall include interface concerns, problems and solutions

The IPER Data Package shall include orbital operations plans

The IPER Data Package shall include end-item data packages (submit a summary of the content prior to review and have package available for inspection at review)

1. As-built configuration list
2. Hardware parts lists
3. Hardware materials and processes lists
4. Test Log Book (including total operating time and cycle records)
5. Open item lists (including reasons for being open)
6. Safety compliance data package
7. Limited life items listings and status
8. Critical parameters trend data
9. Final comprehensive performance test results

The IPER Data Package shall discuss the compatibility of instrument with observatory flight support equipment, ground support equipment and operational ground equipment

The IPER Data Package shall address the availability and readiness of facilities and GSE required for environmental testing

The IPER Data Package shall address the readiness of environmental test plans and procedures

The minutes and results of this review, with action items and responses, shall also be submitted.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

RE-6

2. Title:INSTRUMENT PRE-SHIP REVIEW (IPSR) DATA PACKAGE

3. Reference:

4. Use:

To evaluate system performance during qualification or acceptance testing, and evaluate readiness to ship from contractor.

5. Preparation Information:

This data package shall address, as a minimum:

The IPSR Data Package shall address responses to action items generated at prior reviews

The IPSR Data Package shall address the solutions to all problems encountered during the environmental test and validation program and the solution rationale.

The IPSR Data Package shall address any rework/replacement of hardware, regression testing, or test plan changes should be highlighted during the test flow discussions

The IPSR Data Package shall address compliance with the test verification matrix

The IPSR Data Package shall address measured test margins versus design estimates

The IPSR Data Package shall address qualification/acceptance temperature margins

The IPSR Data Package shall address any data that has been trended to identify compliance with specification, indicating a change or drift to the trend.

The IPSR Data Package shall address total failure-free operating time of the item

The IPSR Data Package shall address “could-not-duplicate failures” along with assessment of the problem and the residual risk that may be inherent in the item

The IPSR Data Package shall address project assessment of any residual risk

The IPSR Data Package shall provide an update from CDR on shipping containers, monitoring/transportation/control plans

The IPSR Data Package shall address ground support equipment status

The IPSR Data Package shall address post shipment plans

The IPSR Data Package shall address spacecraft integration plan.

The IPSR Data Package shall address launch preparation plan (for Flight Models)

The IPSR Data Package shall address approval of safety status for flight, range, ground hardware and operations

The minutes and results of this review, with action items and responses, shall also be submitted.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

RE-7

DATA IN SUPPORT OF MISSION LEVEL REVIEWS

3. Reference:

4. Use:

Provide OLI information to the lead entity in support of mission level reviews.

5. Preparation Information:

Provide documentation, and information in of support the mission contractor for Mission level reviews, such as PDR, CDR, PSR, FOR, MOR, LRR, IOCR (assuming launch within 24 months of IPSR).

SOFTWARE DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-1

SOFTWARE DEVELOPMENT AND MANAGEMENT PLAN

3. Reference:

4. Use:Defines contractor activities required to develop and manage software

5. Preparation Information:

Topics to be included in the Software Development and Management Plan are:

- A. Purpose and Description;
- B. Resources, Budgets, Schedules, and Organization;
- C. Acquisition Activities;
- D. Development Activities;
- E. Sustaining Engineering and Operations Activities;
- F. Quality Assurance;
- G. System safety;
- H. Risk Management;
- I. Configuration Management;
- J. Delivery and Operational Transition
- K. V&V and IV&V;

L. COTS, GOTS, and MOTS software.

Additionally, the Contractor shall evaluate all flight software for the OLI using software metrics. The metrics collected and trended shall be plotted, if possible, and presented monthly. Metrics shall include at a minimum:

- A. Number of flight software requirements and their change status
- B. Design/Code complexity index at CSU, CSC, and CSCI levels
- C. Source code production rate estimates versus actuals
- D. Number of Software Change Requests/Problem Reports and their status
- E. Resource margins for Utilization of memory, CPU, I/O Bandwidth and Bus traffic
- F. Effort data (staffing profile) estimates versus actuals

Include an alphabetized list of definitions for abbreviations and acronyms used in this document. Include an alphabetized list of definitions for special terms used in the document, i.e., terms used in a sense that differs from or is more specific than the common usage for such terms.

Material that is too detailed or sensitive to be placed in the main body of text may be placed in an appendix or included as a reference. Include the appropriate reference in the main body of the text. Appendices may be bound separately, but are considered to be part of the document and shall be placed under configuration control as such.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SW-2

2. Title:OLI DATA FORMAT CONTROL DOCUMENT

3. Reference:

4. Use:

For the interface with the spacecraft, the ground processing, and the science community to ensure a full understanding of the data.

5. Preparation Information:

The Contractor shall provide LDCM Data Format Control Documents that provide detailed data format and content of the the data interface between the RBS and DSAP, of the specific OLI image data and ancillary data files as stored on the DSAP and specific detailed data formats and outputs of the DSAP for OLI data transferred via the DSAP SMD and Direct Downlink interfaces.

The DFCD also includes details bit definitions, command, meta and ancillary data definitions for all OLI telemetry and command data between the spacecraft and OLI and its subsystems.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-3

SOFTWARE DESIGN DOCUMENT/USERS GUIDE

3. Reference:

4. Use:

Describes the software design and operation for use by software maintenance team.

The Software Design Document describes in detail the architecture, structure, and organization of a particular Computer Software Configuration Item (CSCI), decomposing the top-level CSCI into Computer Software Components (CSC) and lower levels of units as appropriate. The SDD describes each unit of software in terms of its interfaces (input/output), data architectures, and processing (eg. logic, algorithms).

The Software Users Guide shall contain the information required to use the software, including detailed procedures and functionalities

5. Preparation Information:

Provide a system level design overview that contains:

- (a) Design Methodology
- (b) Design Overview
- (c) Design Studies
- (d) Design Issues

(e) Hardware Interface

Provide a system design description that contains, at a minimum

- (a) Subsystem Description for each subsystem
- (b) Software Description for each software component
- (c) Software Interface Control Description for both software-to-software and software-to-hardware interfaces

Describe the system operations design, including:

- (a) Operations Scenarios
- (b) User-System Interface
- (c) Operations Environment and Facilities

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-4

SOFTWARE TEST READINESS REVIEW (SWTRR) DATA PACKAGE

3. Reference:

4. Use:

Presents the description and results for the S/W and System Integration/Test program.

5. Preparation Information:

This design review package shall address, as a minimum:

- A. All documentation as called for in the Software Development and Management Plan
- B. Test and Integration program descriptions and results
- C. Software test results
- D. Failure report summaries including status of action and rationale for closure
- E. As-built documentation summary

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-5

SOFTWARE ACCEPTANCE REVIEW (SWAR) DATA PACKAGE

3. Reference:

4. Use:

For review of all test data and designs for compliance against specification requirements, variances, mission operations requirements, etc.

5. Preparation Information:

This data package shall address, as a minimum:

- A. Results of the functional and interface tests
- B. Malfunctions and corrective actions
- C. Reliability predictions
- D. Comparison of measured performance with requirements and discussion of the effect of any variance and waivers
- E. Mission operation constraints
- F. Safety requirements

- G. Maintenance and operation manuals
- H. Interface concerns, problems and solutions
- I. Compatibility of instrument with observatory flight support equipment, ground support equipment and operational ground equipment

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-6

GSE SOFTWARE TEST READINESS REVIEW (GSWTRR) DATA PACKAGE

3. Reference:

4. Use:

Presents the description and results for the S/W and System Integration/Test program.

5. Preparation Information:

This design review package shall address, as a minimum:

- A. All documentation as called for in the Software Development and Management Plan
- B. GSE Test and Integration program descriptions and results
- C. GSE software test results
- D. Failure report summaries including status of action and rationale for closure
- E. As-built documentation summary

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-7

FLIGHT SOFTWARE TEST PLAN

3. Reference:SOW

4. Use:

Provide overall view of the instrument's software acceptance test program detailing test philosophy objectives and rationale for all software testing and hardware/software integration activities planned for the program.

5. Preparation Information:

This shall incorporate the requirements of the MAR.

This shall include, as a minimum:

- A. Tests to be accomplished to demonstrate that the software meets requirements
- B. Test environment
- C. Required test data
- D. Expected results
- E. Test schedules
- F. Special operating conditions (if required)

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SW-8

2. Title:SOFTWARE TEST PROCEDURES

3. Reference:

4. Use:To define the software test procedures.

5. Preparation Information:

These software test procedures shall be prepared to implement software testing as required in accordance with the MAR.

As a minimum these procedures shall define the objectives, test requirements, test limits, pass/fail criteria, test fixtures and instrumentation, handling procedures, environment, and test recording requirements.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-9

SOFTWARE TEST REPORTS

3. Reference:SOW, MAR

4. Use:Provide summary of the software acceptance testing and/or retesting activities

5. Preparation Information:

These reports shall be prepared in accordance with the OLI MAR.

These reports shall be developed for each test described in the Software Test Plan and shall include the following, as a minimum:

- A. Version number of software tested
- B. Identity and number of planned tests that have been completed
- C. Conformance of test results to expected results
- D. Number, type, and criticality of discrepancies
- E. Identification of software areas tested
- F. Analysis of any performance requirements that the tested software could affect

G. Test result summary

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SW-10

SOFTWARE DELIVERY PACKAGE

3. Reference:

4. Use:

A software delivery package is required with submittal of each software release for GSFC acceptance. There are three items comprising the software delivery package. The first item is the delivery letter describing what is being delivered. The second item is the software on appropriate media. The third item is accompanying documentation.

5. Related Documents:

6. Preparation Information:

A software delivery package is required prior to submittal of each software release for GSFC acceptance. The software delivery package shall include the following information with appropriate approvals:

- A. Software Delivery Letter, one page in length, which defines briefly what is being delivered, contains in its attachments the details of the delivery, and identifies a point of contact for resolution of questions/misunderstandings/problems involving the

delivery. Attachments which support the delivery letter are described in items (a) through (k) below:

- (a) Description of Delivery Contents – Identify the delivery in terms of subsystem, release number(s), configuration ID(s), media type(s) (tapes, diskettes, other) and number of copies.
- (b) Build Instructions - Provide instructions to be used in building the delivered software, including the version number of system or vendor-supplied software required to build the system. The supplier should provide evidence that these instructions have been executed prior to delivery and that the software has been built successfully using them (As Built Configuration).
- (c) Special Operating Instructions – Indicate any special instructions that test or operations personnel need to know in using the software. These may include, for example, the use of special simulators, changes to operational procedures, the addition of new files, file format changes, operating constraints/limitations, workaround resolutions to documented problems, operational software version numbers, and associated database version numbers.
- (d) List of Resolved Anomaly Reports and Change Requests.
- (e) List of Unresolved Anomaly Reports and Change Requests.
- (f) Copy of Resolved Anomaly Reports and Change Requests.
- (g) Copy of Unresolved Anomaly Reports and Change Requests.
- (h) Matrix of requirements addressed by this release (may be done by reference to mapping of requirements identified in requirements specification document).
- (i) Release History Summary Matrix.
- (j) Inventory of the Delivered Media – Produce the inventory from the media themselves,
- (k) List of Release Documentation, e.g. users guide procedures.

B. Software Delivery Media

The second of the three items of the delivery package is the delivered software. Provide this software on the media in accordance with the contract schedule. The media can be magnetic disk, magnetic tape, optical media, paper listings, etc. Number of copies of the media is in accordance with the contract schedule.

C. Accompanying Documentation

The third and final item included in the software package is the documentation that describes the delivered software. Provide copies of the following:

- (a) Users Guide.
- (b) Software Description consisting of the following:
- (c) Requirement(s) Documentation or draft change pages.
- (d) Design Documentation or draft change pages.
- (e) Data Definitions

Test Plans, Procedures and Results as appropriate.

INTEGRATION AND TEST DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

IT-1

2. Title:

SPARE PARTS PLAN

3. Reference:

4. Use:

To review contractor's spares list.

5. Preparation Information:

The Spares Parts Plan shall define and justify the contractor's position for the spares proposed for the OLI program. This plan shall also present the schedule and method for obtaining the spares. The Plan shall provide a listing of Spare Parts. For the purposes of this CDRL, the contractor should concentrate on parts that are not commonly available, or may cause schedule problems if out of stock.

Further, this plan shall address all of the requirements of the SOW.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

IT-2

COMMAND AND TELEMETRY LIST AND DESCRIPTION

3. Reference:

4. Use:

For determining the commands required for instrument operation and the definition of all instrument telemetry data

5. Preparation Information:

This shall contain a complete list of instrument commands for all instrument modes of operation and sequence testing with a description of their effects, and it identifies any critical commands which may damage the instrument in certain situations.

This shall contain a complete list of engineering telemetry data coming from the instrument, including engineering telemetry calibrations, the levels or responses expected in response to commands, and levels which require alerts or immediate actions.

The contractor shall generate a Telemetry & Command Handbooks (T&C) Vol 1 and Vol 2 where:

Vol 1 is formats, (e.g, How CCSDS is Implemented, frame headers etc.)

And is required to be delivered at or before CDR

Vol 2 is the telemetry and commands descriptions including thresholds,

conversion, etc. This version shall be available at the beginning of I&T with the first formal delivery at MOR and, updated as required ...

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

IT-3

DETAILED TEST PROCEDURES

3. Reference:

4. Use:

- Provide detailed procedures required to integrate subsystem components into the OLI instrument.
 - Provide detailed procedures required to perform subsystem, system tests.
 - For defining test procedures for establishing Instrument and GSE compliance to OLI specifications.
-

5. Preparation Information:

Each procedure shall be prepared in accordance with the MAR and shall include, as a minimum:

- A. Nomenclature and identification of the test article. Identification of test configuration and any differences from flight configuration
- B. Identification of objectives and criteria established for test by the applicable verification plan or specification. Where tests are run by computer program, the applicable test specification and computer program subroutine number must be identified
- C. Characteristics and design criteria to be inspected or tested, including values for acceptance and rejection, with actual date recorded
- D. Layout and interconnection of test equipment and articles including the grounding scheme. Location and identification of all measuring points on appropriate schematics and diagrams

- E. Description of integration tests planned for each subsystem, instrument and interrelationship verification testing
- F. Planned use of GSE, breakout boxes, simulators, etc.
- G. Hazardous situations and operations and abort conditions
- H. Environmental and/or other conditions to be maintained, including contamination controls
- I. Environmental levels and tolerances
- J. Responsibilities and chain-of-command for test performance
- K. A tabulation of (1) all test target temperatures for all equipment in thermal vacuum, and (2) all predicted test temperatures for all equipment in thermal balance
- L. Time ordered sequence of steps to perform the test or activity.

These procedures should define expected results in telemetry and associated caution and warning levels.

Describe all procedures to be used at Goddard Space Flight Center facilities, other integration facilities and the launch site for all hazardous operations as well as the procedures to control them. Procedures at the launch site shall comply with the launch site requirements.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:IT-4
PROCEDURES2. Title:

PACKAGING, HANDLING, STORAGE, AND TRANSPORTATION (PHS&T) PLAN AND

3. Reference:

MAR 2.3

4. Use:

Provide the instructions and procedures for safe and effective packaging, handling, storage, and transporting of OLI and associated GSE throughout the mission contract.

5. Preparation Information:

This documentation shall discuss the plan and all of the step-by-step procedures for the packaging, handling, storage, and transporting of OLI, spares, and GSE. The documentation shall include:

- A. Nomenclature of all supportive equipment
- B. Calibration and load-tested data
- C. Identification of special environmental conditions, such as cleanliness, temperature, humidity, etc., and the controls to be implemented to maintain those conditions

- D. Format for recording QA stamp, deviations and approval columns
- E. Requirements for special tools, equipment, special handling fixture and containers
- F. Method of transportation and carrier
- G. Procedures to comply with local, state and federal safety requirements
- H. Procedures for maintaining contact with the transported item (where applicable

These shall be prepared in accordance with the MAR.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

IT-5

2. Title:STORAGE TESTING PROCEDURES

3. Reference:

4. Use:

For defining procedures to be used for instrument storage testing.

5. Preparation Information:

As a minimum, these procedures shall define the objectives, test requirements, test limits, test intervals, test fixtures and instrumentation, handling procedures, environment, and test recording requirements.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

IT-6

2. Title:OLI TO SC INTEGRATION PROCEDURE

3. Reference:

4. Use:

To provide methods to be used for integrating the OLI instrument to the spacecraft.

5. Preparation Information:

These procedures shall provide a step by step instructions, including top assembly view and an exploded view of how the instrument is to be mounted to the spacecraft. Identify test measurements to be made and recorded at different assembly levels, handling and environment requirements, and photographic recording. These procedures shall identify any fixtures needed for integration.

Identify all fixtures, GSE, and handling requirements that are required for integration onto the spacecraft and to support Observatory level testing.

CALIBRATION/VALIDATION DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

CV-1

CALIBRATION/VALIDATION PLAN

3. Reference:

4. Use:

Controlling document for definition of calibration requirements, equipment and methods.

5. Preparation Information:

The Contractor shall provide a Calibration/Validation Plan for the OLI System that describes the approach for characterizing the spectral, spatial, radiometric and geometric performance of the OLI, ensuring that the OLI and OLI data products satisfy the OLI Specification requirements Pre-Launch, and Post-Launch in accordance with the Special Test Requirements (STR).

The Calibration/Validation Plan shall incorporate the following information at a minimum:

A. A description of planned tests including:

- (a) what is being tested and how it relates to instrument performance and the data specification
- (b) integration level for test, i.e. part, subassembly, assembly, instrument, observatory
- (c) environmental conditions for test, e.g. ambient, thermal-vacuum, on-orbit

- (d) operational phase of testing, i.e. pre-launch, or post-IOC
 - (e) theoretical basis for the test (how the test is performed, how the data are reduced and why it is done this way- equations and physics)
 - (f) the resolution, precision and accuracy of the results
 - (g) test equipment and setup
 - (h) description of test results usage, i.e. processing algorithms that use test results or calibration parameters generated by the test
- B. A test schedule and flow chart
 - C. How test results are made available
 - D. Government access and participation in pre-launch testing including a GFE transfer radiometer/EOS radiometric scale realization activities and any government diffuser BRDF characterization activities
 - E. Description of COTS and custom analysis tools
 - F. A description of the On-Orbit Calibration capabilities of the LDCM sensors, their design, how they are characterized, and how they are used
 - G. Reference Standards and their calibration traceability
 - H. Support data requirements, e.g. GCP, DEM, reference images

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

CV-2

CALIBRATION/VALIDATION PROCEDURES

3. Reference:

4. Use:

5. Preparation Information:

The Contractor shall provide Calibration/Validation procedures for each planned test. The procedures shall minimally include step-by-step instructions, test equipment and calibration reference requirements, assumptions, associated algorithms, analysis techniques, expected results, output data format, and pass/fail criteria. Descriptions of each test shall include (at a minimum): test facilities, mechanical & electrical ground support equipment, stimuli, levels, durations, configurations, sequence of events, and trending of performance characteristics during verification testing.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

CV-3

CALIBRATION/VALIDATION TEST REPORT

3. Reference:

4. Use:

5. Preparation Information:

The Contractor shall provide a Calibration/Validation Test Report for each planned test. All supporting data shall be provided in electronic format, where applicable.

The Calibration/Validation Reports shall include at a minimum:

- A. Identification of test article or component with date of test
- B. Performance trends during and between each planned test
- C. Problems or failures with tests or procedures
- D. Anomalies and deviations from plans or procedures
- E. Test results, including any calibration parameters to be used for on-orbit processing and comparison of results with

expectations and requirements

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

CV-4

CALIBRATION/VALIDATION SUMMARY REPORT

3. Reference:

4. Use:

5. Preparation Information:

The Contractor shall provide a Calibration/Validation Report in two phases. The Pre-Launch report shall describe the pre-launch calibration process and results and is delivered at IPSR (TBR); the Post-Launch Report shall describe the calibration process and results from launch to IOC and is delivered six months after IOC. Each shall document the state of the instrument calibration relative to the OLI Specification. The reports shall include details of any anomalies affecting the data, descriptions of the instrument calibration and characterization tests, references to the test reports from DID SE4, and long term trending results. The Post-Launch Report shall include any changes to the calibration parameters and algorithms during the Commissioning period. These reports shall be designed to serve as instrument calibration references for current and future users of the LDCM data set.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

CV-5

RADIOMETRIC MATH MODEL

3. Reference:

4. Use:

For evaluating the end-to-end radiometric performance of the instrument; for allocation of error budget, etc.

5. Preparation Information:

- A. The Radiometric Math Model shall be used to evaluate the end-to-end radiometric performance of the OLI instrument; conduct sensitivity analyses; determine absolute and relative calibration accuracies; identify major error contributors which can be eliminated during the design phase; identify impact of error budget trades; assess instrument performance in terms of Signal to Noise Ratio (SNR), Noise Equivalent Radiance (NEAL), stability in orbit, etc.
- B. The model shall be related to actual test and calibration data; the model shall be updated and refined during the course of the OLI development program until it simulates instrument performance accurately.
- C. Also to be included in the model are on-board and preflight ground laboratory calibration algorithms and a data book that contains all pertinent measured data required by the calibration algorithms. The on-board calibration algorithms are used along with ground calibration data to demonstrate that the absolute and relative radiometric accuracies are being met. The on-board calibration algorithms are deliverables, in a form suitable for incorporation into the OLI DIS and Interface Data

Processing Segment (IDPS) Total System Performance Responsibility (TSPR) contractor for NPOESS, which convert form digital counts to calibrated spectral radiance based upon all on-board calibration devices. The calibration data shall also be provided in a mutually agreed upon computer-compatible form.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

CV-6

2. Title:OLI OPTICAL ANALYTICAL MODEL

3. Reference:

4. Use:

For evaluating the end-to-end geometric and spatial performance of the instrument, allocation of error budgets, and to provide a framework for thermal and mechanical sensitivity analyses.

5. Preparation Information:

Component Models

- A. Focal Plane Model (size/shape/placement of pixels , integration time, sampling rate)
Detector layout and sampling
- B. Optical Model (optical system Cardinal Points, FOV, Spatial/Spectral imaging performance such as MTF and 5th order aberrations modeling, in a static nominal setting and tolerance analysis of effects of physical shifts of any static or dynamic components in the optical system, and physical differences in fabricated components from design requirements – i.e radius of curve, index, coating quality, centeration, polished surface finish)
- C. Geometrically characterize and model any dynamically moving part/s in the optical system such as Scanning/Pointing Mechanism, Yaw steering table/mirror, to extract the expected line of sight jitter

Dynamic Models

A. Thermal Sensitivity Model

Variations in component models with temperature – related to thermal math model

B. Vibration Sensitivity Model

Sensitivity of component models to vibration – related to structural math model

Performance Models

A. Spatial Performance

Predicted edge response based on integrated component and dynamic models

B. Geometric Performance

Predicted line of sight knowledge and stability based on integrated component and dynamic models

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

CV-7

ALGORITHMS AND CALIBRATION PARAMETERS

3. Reference:

4. Use:

Algorithms for determination of instrument calibration from pre-launch and on-board calibration devices and pre-launch calibration parameters required for image processing

5. Preparation Information:

Required algorithms:

- A. For processing of solar diffuser data to absolute calibration coefficients
- B. For determination of diffuser degradation based on the diffuser stability monitor
- C. For determination of each detectors dark response during earth image acquisition based on the dark pixels and dark data acquired before and after the earth acquisition.
- D. For determination of detector response based on the internal lamp system
- E. For determination of radiometric stability through launch using the transfer to orbit on-board calibration devices
- F. For usage of any other calibration devices
- G. For computing a line of sight relative to the instrument optical axes for each detector on the OLI focal plane.
- H. For transforming detector lines of sight relative to the instrument optical axes to lines of sight relative to the instrument

mounting surface using data from instrument jitter sensors and/or yaw steering mechanisms as required.

Required Calibration parameters:

- A. Pre-launch detector by detector absolute gains that meet the detector to detector uniformity and absolute accuracy requirements
- B. Pre-launch detector bias estimates
- C. Coefficients characterizing detector gain and bias sensitivity to temperature
- D. List of dead, inoperable and out-of-spec detectors
- E. Line of sight angles and/or apparent (i.e., including the effects of optical distortion) detector locations relative to the OLI optical axes for each detector on the OLI focal plane.
- F. Orientation/alignment matrix relating instrument jitter sensors to the OLI optical axes.
- G. Scaling coefficients that convert jitter sensor counts to angular displacement.
- H. Transfer functions describing the sensitivity of the jitter sensors to vibration as a function of frequency.
- I. Scaling coefficients and/or alignment matrices that describe the orientation of the instrument optical axes relative to the instrument mounting surface as a function of yaw steering mechanism position.

SYSTEMS ENGINEERING DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SE-1

CONFIGURATION CHANGE REQUESTS (CCR) CLASS I

3. Reference:

4. Use:

Class I changes are to be used as a vehicle for orderly processing of change requests to appropriate level of approval authority for disposition. Class II changes are to be used as a vehicle for processing of all change requests not classified as Class I to appropriate levels for concurrence. Class I changes impact form, fit, or function.

5. Preparation Information:

Consistent with the contractors' Configuration Management Plan (CMP), the contractor shall prepare Class I Change Requests for all changes that may impact form, fit, function, cost, schedules or performance. These changes shall be processed according to the procedures outlined in the CMP and shall be reviewed and approved by appropriate levels of the Configuration Control Board.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SE-2

CONTRACTOR - GENERATED INTERNAL TECHNICAL INFORMATION

3. Reference:

- Statement of Work
 - Performance and Operational Specification for the OLI
-

4. Use:

To review technical information related to the OLI program.

5. Preparation Information:

This memoranda shall be typed or hand-printed and may contain hand-drawn sketches to preserve informality and timeliness.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SE-3

ENGINEERING ANALYSES & TEST REPORTS

3. Reference:

4. Use:

- To aid in making judgments and decisions regarding numerous specific technical subjects relative to the OLI instrument and GSE design. These analysis shall be reviewed periodically through the program both formally (design reviews), and informally (with GSFC Contract Officer Technical Representative - COTR).
 - For review of tests and test results obtained for engineering tests performed on the instrument or instrument subsystems.
-

5. Preparation Information:Analyses:

Formal documentation of these analyses is required for the design reviews (data package); however, to aid the informal coordination and design monitoring/review with the GSFC team, the Contractor shall supply advance copies of these analyses, herein called Engineering Analyses Reports (EARs), to the COTR. EAR carrying the signature of the contractor's Project Manager shall be delivered on a timely basis - i.e., as they are completed. Each EAR shall be typed but may contain hand-drawn sketches to preserve informality and timeliness. The Contractor, at his discretion, may use the EARs directly or indirectly, as appropriate, to supplement formal documentation requirements so as to avoid unnecessary duplications of effort.

A partial list of possible EARs follows for guidance purposes only and may be amended with the mutual consent of the contractor and

the COTR. Similarly, the schedule due dates for each of these EARs shall be mutually agreed upon.

Possible list of EARs includes:

- A. Thermal analysis and design
- B. Analysis of in-flight calibration techniques, accuracies and expected changes over lifetime
- C. Analysis of polarization sensitivity, how to minimize, achieve, and demonstrate
- D. Analog amplifier analysis (stage-by-stage, each channel to include SNR, bandwidth, gain, stability, etc.)
- E. Logic and timing circuits - functional description, timing diagrams
- F. Possible cost savings, increased cost-effectiveness (end of design definition phase)
- G. Mechanical-structural analysis and design (Technique used for analysis shall be mutually agreed upon by contractor and COTR)
- H. Analysis of bearing-to-housing fits, tolerances, thermal effects
- I. Results of computer analysis of beam alignment design, tolerances and error budget
- J. Scan motor torque analysis
- K. Review of how the spacecraft contractor will align and periodically check the alignment of the OLI to the spacecraft
- L. Detailed analysis of power requirements and power profile. Following the initial systems review a summary updated chart or table shall be supplied monthly.
- M. Detailed weight breakdown analysis, as well as a summary to be updated monthly following initial systems review showing the changes, reasons, and differentiation between calculated, estimated or actual weights
- N. Analysis of expected scan linearity and jitter
- O. Worst case performance analysis of all mechanical, electrical and optical systems with regard to radiation, age, voltage, and temperature extremes, etc.

Test Reports:

These reports shall identify, as a minimum, the test requirements, test limits, test fixtures environment, test equipment, test results, and any failures and corrective actions.

These reports shall be developed for each test and shall include the following, as a minimum:

- A. Identity and number of planned tests that have been completed
- B. Conformance of test results to expected results
- C. Number, type, and criticality of discrepancies
- D. Identification of software areas tested
- E. Analysis of any performance requirements that the tested software could affect
- F. Test result summary

The actual test results shall either be attached to the report(s) or maintained on-site.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SE-4

2. Title:TREND ANALYSIS (LIST AND REPORTS)

3. Reference:MAR 4.5.1

4. Use:

Provides a list of critical engineering and performance parameters for the OLI instrument.
Tracks critical engineering and performance parameters for the OLI instrument.

5. Preparation Information:

The developer shall assess all subsystems and components and provide a list identifying key parameters that relate to performance stability. Starting at component acceptance testing and continuing during the system integration and test phases, these parameters are to be monitored for trends leading toward degradation of performance or reliability of OLI.

The monitoring shall be accomplished within the normal test framework; i.e., during functional tests, environmental tests, etc. The developer shall establish a system for recording and analyzing the parameters as well as any changes from the nominal even if the levels are within specified limits. Results to be reviewed with operational personnel prior to launch. Trends should be recorded throughout the mission by the operational personnel.

In addition, for each mission, a log shall be maintained for each instrument of the accumulated operating time. The log shall include the following information, as a minimum:

- A. Identification of hardware item
- B. Serial number
- C. Total operating time since assembly as a unit
- D. Total operating time since last failure
- E. Total additional operating time projected for the unit prior to launch
- F. Identification of key parameters being monitored
- G. Upper/lower spec tolerance limit for each parameter being monitored
- H. Summary statement of any trending noted in earlier measurements of each parameter
- I. Observed value (in sequence) for the reporting interval
- J. Assessment of trends to date

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SE-5

2. Title:STRUCTURAL MATH MODEL

3. Reference:

4. Use:

For providing instrument interface information to be utilized in various static and dynamics observatory analyses.

5. Preparation Information:

The deliverable OLI Structural Math Model shall meet all requirements listed in the ICD. In addition to these requirements, the math model shall be compared with a modal survey carried out on the structural/thermal model to verify frequency and mode shape predictions of the structural math model. The frequency predictions shall agree with the modal survey results to within 5 percent for the first mode and 10 percent for all other significant modes up to 100 Hz. In addition to the frequency correlation, the mode shape correlations between test and the analytical model shall include a cross-orthogonality check, a mode shape geometric similarity check, and a static deflection check. The final update of the structural model shall include any modifications required to correlate the model to the physical test results.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SE-6

2. Title:THERMAL MATH MODEL

3. Reference:

4. Use:

To evaluate the thermal performance of the instrument.

5. Preparation Information:

The model shall be composed of at least 250 nodes. The Thermal Math Model shall have sufficient detail of all subsystems and critical interfaces to accurately predict absolute interfaces. These models shall be verified and refined after comparison with thermal test data.

SINDA-compatible and TRASYS-compatible reduce, node versions of the full instrument thermal math model, appropriately documented, are required for analytical integration with the spacecraft. A users guide shall be provided for deliverable math models.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SE-7

WIRING DIAGRAMS

3. Reference:

4. Use:

For definition of all wire flows of the instrument electronics.

5. Preparation Information:

These wiring diagrams shall cover the system, subsystem, component electronics and GSE. It shall identify each wire by its classification:

- Ground
- Signal
- Power

The diagrams shall trace each wire's runs identifying all path connections (by connector/pin number).

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SE-8

APPROVED OR CONTROLLED DRAWINGS

3. Reference:

4. Use:

For evaluating OLI development and for use as anomaly resolution tools during operation.

5. Preparation Information:

As a minimum, this information shall consist of all drawings under configuration control including mechanical drawings, electrical schematics, logic diagrams, and block diagrams. The logic diagrams shall cover the system, subsystem and component electronics and shall identify the signal inputs and outputs, internal signal flow, and the next level external connections.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SE-9

2. Title:SYSTEM PERFORMANCE VERIFICATION PLAN

3. Reference:SOW 4.1; MAR 9.2.1

4. Use:

Provides the overall approach for accomplishing the verification program. Defines the specific tests, analyses, calibrations, alignments, etc. that will demonstrate that the hardware complies with the mission requirements

5. Preparation Information:

The System Performance Verification Plan describes the approach (test, analysis, etc.) that will be utilized to verify that the hardware/software complies with mission requirements. If verification relies on tests or analyses at other level of assemblies, describe the relationships. The System Performance Verification Plan will include a section describing the environmental verification program which stipulates the specific environmental parameters used in each test or analysis required by the System verification plan. Payload peculiarities and interactions with the launch vehicle will be considered when defining quantitative environmental parameters under which the hardware elements must meet their performance requirements.

This Plan includes level of assembly, configuration of item, objectives, facilities, instrumentation, safety considerations, contamination control, test phases and profiles, appropriate functional operations, personnel responsibilities, and requirements for

procedures and reports. For each analysis activity, include objectives, a description of the mathematical model, assumptions on which the model will be based, required output, criteria for assessing the acceptability of the results, interaction with related test activity, and requirements for reports.

The Plan provides for an operational methodology for controlling, documenting, and approving activities not part of an approved procedure. It also includes controls that prevent accidents that could damage or contaminate hardware or facilities, or cause personal injury. The controls will include real-time decision-making mechanisms for continuation or suspension of testing after malfunction, and a method for determining retest requirements, including the assessment of the validity of previous tests. Include a test matrix that summarizes all tests to be performed on each component, each subsystem, and the payload. Include tests on EDU performed to satisfy qualification requirements. Define pass/fail criteria.

A section of the plan will be a “System Performance Verification Matrix” summarizing the flow-down of system specification requirements that stipulates how each requirement will be verified, and summarizes compliance/non-compliance with requirements. It will show each specification requirement, the reference source (to the specific ; Paragraph or line item), the method of compliance, applicable procedure references, report reference numbers, etc. The System Performance Verification Matrix may be made a separate document.

DESCRIPTION OF REQUIRED DATA1. CDRL No.:

SE-10

2. Title:

VERIFICATION REPORTS

3. Reference:

MAR 9.2.1.3

4. Use:

Provide summary of integration and testing results, conformance, non-conformance, and trend data.

5. Preparation Information:

Integration and test reports are required for all such activities commencing at component level testing for each mission. Contents of these reports shall include, as a minimum:

- A. Summary of the test results of each activity and an assessment of the quality and acceptability of the item tested
- B. Summary of the non-conformance occurring during the test and their resolution and corrective actions taken
- C. Trends in the performance of critical components
- D. Actual sequence of these operations including dates and times
- E. For thermal testing, tabulation of test target temperatures and actual test temperatures for all equipment and components

- F. For thermal balance testing, a tabulation of test prediction and actual temperatures and a tabulation of other pertinent targeted parameters vs. their actual test values, such as heater powers, heater place temperatures, solar intensity, etc.
- G. For follow Instruments, compare results to previous instrument(s)

These shall be prepared in accordance with the MAR.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SE-11

INTERFACE CONTROL DOCUMENTS INPUT

3. Reference:

4. Use:

To coordinate and control all interface items between the instrument and the spacecraft bus to provide efficient electrical and mechanical integration.

5. Preparation Information:

The Contractor shall support the preparation of Interface Control Documentation (ICD) by Goddard Space Flight Center and its spacecraft contractors by providing detailed information regarding the instrument interface to the spacecraft bus. The data provided by the instrument contractor may be in the form of written documentation, drawings, and schematics, and will be incorporated into the combined instrument and spacecraft ICD for applicable signatures. The instrument to spacecraft bus interface shall include the following topics, as a minimum:

- A. Physical Requirements, such as mass properties, footprint, clearance envelope, drill template, alignment, orientation, field-of-view (optical, thermal, glint, RF), including tolerances.
- B. Electrical Connectors, such as regarding configuration, type, orientation, pin assignments.
- C. Thermal control coating blankets, heat flow and operating limits.

- D. Red and green tag items for test and flight.
- E. Characteristics of Electrical Power and Signals, such as timing clock pulses, data busses, signal (name, type, function), voltage and current limits, frequencies, waveforms, rise and fall time, duration, periodicity, shielding, grounding, formats, line driver/receiver characteristics, power fusing, voltage, currents, ripple regulation.
- F. Software, such as codes, processors, memory storage, application description, uses.
- G. Environmental, such as vibration, shock, acoustic, EMI/EMIC, ESD, thermal, contamination, purges.
- H. Safety, such as pyrotechnics, energy, trip-over, hazardous materials.
- I. GSE, such as mechanical, electrical, test specific, targets, stimulators.
- J. Handling instructions
- K. Operational Factors, such as compression, general flight rules, and limitations.

The contractor shall show sufficient detail on both sides of each interface to provide a clear picture of the resultant mated interface. For example, electrical interfaces should be presented to schematic detail (logic elements and piece parts) to the point where impedance and transfer characteristics no longer affect the interface.

SYSTEMS ASSURANCE DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-1`

2. Title:RELIABILITY REPORT

3. Reference:MAR 4.3, 4.4, and 4.4.2

4. Use:

- Sensitivity analyses;
 - Evaluations of the effects of design trade-offs or configuration changes;
 - Evaluations of the ability of the design to achieve the mission life requirement;
 - Inputs into Government Probabilistic Risk Assessment (PRA)
-

5. Preparation Information:

This Report consists of three parts, the Reliability Prediction (RP), the Failure Modes and Effects Analysis (FMEA), and the Fault Tree Analysis (FTA). These parts may be submitted together or in separate volumes.

The RP shall be prepared in accordance with the MAR X.X

- A. Initial assessments shall use the parts count reliability prediction methodology of MIL-HDBK-217.
- B. As design matures, develop a complete reliability block diagram, failure definitions, and mathematical models in accordance with MIL-HDBK-217.

The FMEA shall be prepared in accordance with the MAR (x.x). The following shall be provided, as a minimum:

- A. Failure modes analysis
- B. Severity levels of the failure effects as defined in the MAR.
- C. Critical Items List (CIL)
- D. Summary of Failure modes identified

The FTA shall be prepared in accordance with the MAR (x.x). The following shall be provided as a minimum:

- A. the ground rules for the analysis, including definitions of the undesirable end states analyzed,
- B. references to documents and data used.
- C. the fault tree diagrams.
- D. statement of the results and conclusions.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-2

2. Title:CRITICAL ITEMS LIST (CIL)

3. Reference:MAR 4.4.1

4. Use:

Provides information relative to failure modes that present potential catastrophic or critical effects on the mission as well as information on EEE parts applications that fail to meet the derating criteria.

5. Preparation Information:

This shall include, as a minimum:

- A. Potential catastrophic failures that can't be eliminated from the system
- B. All potential critical/major failures
- C. All part applications that don't conform with derating policy
- D. Justification for retention of each item listed

All failure modes that are assigned to Severity Categories 1, 1R, 1S and 2, shall be itemized on a CIL and submitted with the

Reliability Report. Rationale for retaining the items shall be included on the CIL.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SA-3

WORST CASE ANALYSES

3. References:MAR 4.4.4

4. Use:

Provides worst case analyses of critical parameters to determine worst case margins, limits and stresses.

5. Preparation Information:

Data is to be developed by contractor, in accordance with the MAR for parameters related to items such as electronics circuits, optics, electromechanical devices, and mechanical devices, and mechanical elements.

This shall address the worst case analyses performed on each component. These analyses shall encompass the mission life and shall consider all parameters set at minimum and maximum limits and include the effect of environmental stresses on the operation or parameter.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-4

2. Title:FAILURE/ANOMALY REPORTS (FAR)

3. Reference:MAR 2.2.1.1

4. Use:

- Provides reporting, monitoring, and closure of all malfunctions and failures and their corrective actions for the OLI instrument.
 - To report failures promptly to the Failure Review Board (FRB) for determination of cause and corrective action.
-

5. Preparation Information:

These reports shall provide immediate notification (followed by written confirmation) to both the OLI Contract Officer Technical Representative (COTR) and System Assurance Manager of a malfunction or failure.

Reporting of failures will begin with the first power application at the major component, subsystem, or instrument level (as applicable to the hardware level for which the developer is responsible) or the first operation of a mechanical item; it will continue through formal acceptance by the GSFC project office and the post-launch operations, commensurate with developer presence and responsibility at GSFC and launch site operations.

All failures will be documented on GSFC Form 4-2 or an existing developer form, which identifies equivalent information.

Developers with access to the GSFC FAR Database will generate Problem Failure reports electronically via that program in lieu of hard copies. Developers may also request, from the GSFC Project Office, complimentary electronic copies of the GSFC FAR system for implementation within their own facility.

Updated information will be submitted to GSFC by hard copy or electronically updated via the developer-accessible FAR Database. FARs submitted to the GSFC for closure will include a copy of all referenced data and will have had all corrective actions accomplished and verified.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-5

2. Title:MATERIAL REVIEW BOARD (MRB) DECISIONS ON NON-CONFORMANCE

3. Reference:MAR 2.2.1

4. Use:

Provides information to GSFC relative to contractor MRB actions taken with regards to nonconforming material.

5. Preparation Information:

Prepare in contractor's format in accordance with the guidelines in the MAR. Provide sufficient detail and supporting material to back up the MRB decisions.

Decisions resulting in recommendations for "repair" or "use as-is" shall require additional documentation.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-6

2. Title:RESPONSES TO ALERTS

3. Reference:MAR 6.4

4. Use:

To inform GSFC of the extent of impact of all reported GIDEP Alerts and Problem Advisories on the contract hardware so that the Project can plan appropriate corrective actions.

5. Preparation Information:

These responses to GSFC on the GIDEP Alerts and Problem Advisories shall be prepared in accordance with the MAR and shall be reported within time intervals requested by GSFC as they impact the project hardware.

Initial responses shall be updated as any Alert report is updated by GIDEP.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SA-7

ACCEPTANCE DATA PACKAGE

3. Reference:MAR 2.4

4. Use:

To ensure that the deliverable contract end-items are in accordance with contract requirements prior to NASA acceptance.

5. Preparation Information:

This acceptance data package, as a minimum, shall be comprised of the following:

- A. As-built configuration list
- B. Hardware parts lists
- C. Hardware materials and processes lists
- D. Test Log Book (including total operating time and cycle records)
- E. Open item lists (including reasons for being open)
- F. Safety compliance data package
- G. Limited life items listings and status
- H. Environmental tests results
- I. Subsystem tests results

- J. Calibration tests results
- K. Critical parameters trend data
- L. Final comprehensive performance test results

A copy of this package shall accompany each end item, in addition to the delivery requirements in Table 3-1.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-8

2. Title:LIMITED LIFE ITEMS LIST

3. Reference:MAR 4.6

4. Use:

Provides data on limited life items or items subject to degradation with age used on OLI for GSFC to review and approve acceptability for implementation and for flight.

5. Preparation Information:

Prepare the list and related information for each mission in accordance with the MAR, Para. 8.4.

The list shall include the expected life and the rationale for the selection of each item.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-9

2. Title:MATERIALS IDENTIFICATION LIST (MIL)

3. Reference:MAR 7.2.1

4. Use:Listing of all materials for use in spaceflight hardware.

5. Preparation Information:

The MIL will be prepared and maintained throughout the life of the project. The MIL will be compiled by instrument, instrument component, or spacecraft component, and will include the following information, as a minimum:

- A. Material Name
- B. Manufacturer
- C. Manufacturer's Material Spec. Number
- D. MIL, ASTM, FED. or Other Spec. Number
- E. Procurement Specification

F. Description Of Material

G. Expected Environment

H. Reason for Selection

Any format may be used provided the required information is included. All submissions to GSFC will include a paper copy and a computer readable form.

Updates to MIL will identify changes from the previous submission.

Updates to MIL will be available at the developer's facility for review.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SA-10

SAFETY WAIVER/NON-COMPLIANCE REQUESTS

3. Reference:MAR 4.4.1

4. Use:

Initiate formal request for Range resolution of safety risks that have not been or cannot be eliminated. The three types of non-conformance requests include:

- Meets Intent Certification (MICs)
 - Deviation
 - Waivers
-

5. Preparation Information:

These shall be prepared in accordance with the MAR, using EWR 127-1, section 1.6.5 and appendix 1C. The minimum that shall be included in the request is:

and shall include, as a minimum:

A. Type of request

B. Descriptive title

- C. Category
- D. Effectivity
- E. Background
 - (a) Summary of Range Safety Requirement
 - (b) Statement of non-compliance
 - (c) Reason for request
- F. Condition for MIC, deviation, or waiver
 - (a) Hazard mitigation
 - (b) Get well plan

Each waiver request shall address only non-conformance.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

SA-11

PHOTOGRAPHIC & VIDEO RECORDS

3. Reference:

4. Use:

Program status reviews; system, subsystem, and component packaging evaluations; and trouble shooting.

5. Preparation Information:

A. Still Photography (Digital Preferred)

- (a) Pictures shall be made at appropriate points in the development of OLI.
- (b) Pictures shall be made of the major subsystems, critical components, the full-up system, and major GSE items.
- (c) The pictures shall serve as a record of the build-up of a major component or subsystem; e.g., a typical electronic card, mother board, electronic subsystem with cover off, etc.
- (d) Pictures of environmental test fixtures shall also be provided.

B. Video (Digital Preferred)

- (a) Video tape Instrument moves

(b) Video tape Mechanism movements

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-12

2. Title:PARTS IDENTIFICATION LIST (PIL)

3. Reference:MAR 6.3.2

4. Use:Listing of all EEE parts intended for use in spaceflight hardware.

5. Preparation Information:

The PIL will be prepared and maintained throughout the life of the project. The PIL will be compiled by instrument, instrument component, or spacecraft component, and will include the following information, as a minimum:

- A. Part name
- B. Part number
- C. Manufacturer
- D. Manufacturer's generic part number
- E. Procurement specification

Any format may be used provided the required information is included. All submissions to GSFC will include a paper copy and a computer readable form.

Updates to PIL will identify changes from the previous submission.

Updates to PIL will be available at the developer's facility for review.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-13

2. Title:CONTAMINATION CONTROL PLAN

3. Reference:MAR 12.2

4. Use:

Provide an integrated contamination control plan:

- To define level of cleanliness and methods/procedures to be followed to achieve adequate cleanliness/contamination control
 - To define the approach required to maintain cleanliness/contamination control through shipping, observatory integration test, and flight
-

5. Preparation Information:

A. Pre-flight:

- (a) Define the methods, procedures, and schedule requirements for integrating observatory instruments contamination control requirements in this control plan.
- (b) Define methods for determining a budget for allowable accretions for each phase of the program.

- (c) Define levels of cleanliness and methods/procedures to be followed for this Project, from start of contract to end of mission, referencing all analyses to get performed to assess instrument sensitivity and to define requirements. Show that these methods/procedures are in consonance with the OLI ICD, and UIIS requirements.
- (d) Identify critical fabrication and assembly activities, which will be performed in clean rooms or in clean room benches at ISO class 7 (or lower) level as defined in ISO 14644-1. Provide an integrated operations flow chart.
- (e) Identify the controls over atmospheric contaminants, temperature, and humidity which will be used during electronic fabrication (including soldering), integration, testing, transportation, and launch. Indicate how others controls will meet the requirements, including a description of all facilities that will be used.
- (f) Identify design features of shipping containers, which will keep contamination of flight hardware during shipping and storage within the contamination budget.
- (g) Define the requirements and methods/procedures required to maintain cleanliness during spacecraft and laboratory fabrication, integration, and test.
- (h) Show that the efforts to control contamination are consistent with controls to prevent electrostatic damage.
- (i) Indicate the methods and frequency for monitoring cleanliness levels and accretions to ensure compliance with requirements.
- (j) Define criteria for materials selection and acceptance relative to contamination control.
- (k) Specify criteria for bake-out of critical subsystems.
- (l) Provide a contamination training program. All personnel required to work in clean areas with flight hardware must be trained to work according to clean area procedures.
- (m) Define overall vent location and orientation policy, indicating how unintentional venting shall be avoided. (All applicable drawings should show vent locations that comply with venting analysis.)
- (n) Identify cleaning, inspection, and bagging to be used for parts, flight subassemblies, and the assembled instrument. Identify how other activities will meet the requirements, and reference the procedures used for these activities.

B. Flight

Define the design requirements and design approach for contamination control for launch operation through mission.

This shall be prepared in accordance with the MAR.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-14

2. Title:Missile System Pre-Launch Safety Package (MSPSP) INPUTS

3. Reference:

4. Use:

Documents the hazard identification and elimination/control requirements. (Previously termed Safety Assessment Report, SAR)

5. Preparation Information:

The developer shall submit to NASA a MSPSP relative to the instrument which complies with the requirements of EWR-127 prior to each of the WR safety review. The MSPSP shall be updated as necessary. The content of the package shall identify all safety features of the hardware, software, and system design, as well as procedural related hazards present in the system. It shall include:

- A. Safety criteria and methodology used to classify and rank hazards
- B. Results of hazard analyses and tests used to identify hazards in the system
- C. Hazard reports documenting the results of the safety program efforts
- D. List of hazardous materials generated or used in the system
- E. Conclusion with a signed statement that all identified hazards have been eliminated or controlled to an acceptable level
- F. Recommendations applicable to hazards at the interface of their system
- G. List of safety non-compliances and associated rationale for acceptance

This report will be used by the LDCM Project to generate the MSPSP for submittal to the launch range.

OSSMA will review each submittal prior to submittal of the MSPSP to Range Safety.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-15

2. Title:ORBITAL DEBRIS ASSESSMENT INPUTS

3. Reference:MAR 3.6

4. Use:Ensure NASA requirements for post mission orbital debris control are met.

5. Preparation Information:

The Orbital Debris Assessment shall supply design data sufficient to support the performance of an Orbital Debris Assessment of the Satellite.

The Orbital Debris Assessment shall include mass, dimensions, and material for all individual assemblies and structural elements.

Where assemblies are constructed of more than one material (e.g. titanium motor inside aluminum housing), the Orbital Debris Assessment shall include the mass, dimensions and materials for these items.

(Refer to NPD 871)

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

SA-16

2. Title:MECHANISM LIFE TEST PLAN

3. Reference:MAR 7.1

4. Use:For evaluation and approval of mechanisms.

5. Preparation Information:

All mechanisms shall be qualified by life testing; or heritage of an identical mechanism used in identical applications. The Mechanisms Life Test Plan for shall contain the following, as a minimum:

- A. Table of Contents
- B. Description of all lubricated mechanisms, performance functions, summary of subsystem specifications and life requirements.
- C. Heritage of identical mechanisms and descriptions of identical applications.
- D. Design, drawings and lubrication system utilized by the mechanism.
- E. Test plan including vacuum, temperature and vibration test environmental conditions of the test
- F. Criteria for a successful test.
- G. Delivery of test hardware to Government after a successful test

ON ORBIT DIDS

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:

OO-1

2. Title:

OLI ON ORBIT INITIALIZATION AND VALIDATION PLAN

3. Reference:

4. Use:

Contains the information required to understand OLI operations and constraints during the pre-operational period.

5. Preparation Information:

Prior to each OLI flight opportunity, the contractor shall provide a plan for operating the OLI during the pre-operational period. The plan shall include a pre-operational concept of testing and timelines which call out procedures to be used, tests to be performed, constraints to operations, and any other information required to schedule OLI operations with the observatory.

The roles and responsibilities for conducting operations and contact information for operators, engineers and system support for configuration, maintenance and operation of the interface between Contractor and Government systems shall be provided.

The plan shall provide contractor plans for handling communications and decision making in the event of non-nominal results during testing. These plans shall include, contact information for critical personnel, and identify contingency procedures available.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

OO-2

OLI OPERATIONAL PROCEDURES

3. Reference:

4. Use:

Contains the complete set of procedures required for operating the OLI following Launch vehicle mate and while on orbit. Each phase shall have procedures for testing, calibration, routine, and contingency operations.

5. Preparation Information:

The Operations Procedures shall provide a detailed set of operations procedures for the OLI Instrument. These shall include testing, calibration, routine, and contingency procedures for the following phases:

- A. Pre-launch (while mated to the Launch Vehicle)
- B. Launch and Early Orbit
- C. Initialization and Checkout
- D. Operations
- E. End of life

These procedures should define expected results in telemetry and associated caution and warning levels.

These procedures shall describe the equipment, methods, accuracies, and command sequences for in-flight calibration. Fail-safe methods shall be used for conducting in-flight calibration.

These procedures shall describe the modes of operation, the transitions from one to another, and the command sequences necessary to configure the instrument in any phase of any operational mode described in the specifications.

This document shall be maintained during the operations phase of the LDCM contract and shall be modified as necessary during training, operations exercises and procedure reviews.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

OO-3

OLI DATA USERS MANUAL

3. Reference:

4. Use:

The report shall be a self-contained document in that a reader not familiar with the instrument can obtain a reasonably complete understanding of the instrument without recourse to another document or drawing. The document is not meant to be an engineering working document but a reference document for OLI data users including: Government personnel, scientists, spacecraft contractor personnel, and the general public.

5. Preparation Information:

An OLI Data User's Manual shall be prepared for each instrument. The OLI Data User's manual shall provide non-proprietary description of the system, subsystems, functions and operations, with illustrations, block diagrams and circuitry descriptions. The instrument to spacecraft interface shall be described. The report shall be a self-contained document in that a reader not familiar with the instrument can obtain a reasonably complete understanding of the instrument and its operation without recourse to another document or drawing. The document is not meant to be an engineering working document but a reference document for Government personnel, scientists, spacecraft contractor personnel, and the general public of OLI data users.

Each OLI Data User's Manual shall characterize instrument performance with respect to: relative spectral response; radiometric accuracy, sensitivity, and stability; and line-of-sight accuracy. Each Manual shall provide pre-flight test results characterizing performance and a flight performance evaluation with updates at major milestones. The document shall describe the OLI modes of operation and the equipment, methods, accuracies, and concepts of operation for in-flight calibration of radiometric response and line-of-sight.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

OO-4

OPERATION AND MAINTENANCE MANUALS

3. Reference:

4. Use:For operating and servicing OLI and GSE.

5. Preparation Information:

Operation and maintenance manuals shall be prepared for the OLI and for all GSE. As a minimum these manuals shall contain the system and subsystem description, function and operation, block diagrams and circuitry description, operation and test procedures, maintenance, and performance data. These manuals, in conjunction with the detailed drawings, shall provide all the information needed for operating and servicing the ATMS and GSE. These manuals shall be updated during the program to reflect any changes, including differences between the Engineering Development Unit, the Proto-flight Model, and the Flight Model(s). These manuals shall be provided for the Engineering Development Unit, Proto-flight Model and each Flight Model.

DESCRIPTION OF REQUIRED DATA

1. CDRL No.:2. Title:

OO-5

ON ORBIT PERFORMANCE REPORT

3. Reference:

4. Use:

For documenting the results of the testing program and the performance of the OLI instrument following on orbit calibration.

5. Preparation Information:

For each observatory, a Post IOC Performance Report shall contain the following at a minimum:

- A. Launch and early orbit operations results
- B. On-orbit checkout results
- C. Calibration/Validation results, including observatory environmental test results, and comparison to pre-launch baselines
- D. As run procedures
- E. Algorithms and calibration coefficients used throughout the test period
- F. Anomalous behavior and resolution
- G. Current Status of the OLI, including redundancy
- H. Lessons learned

